and the ReProSpect
Interactive Quantitative module
for Agriculture

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❶ The ambition

Having a quantitative tools for :

1. Revisiting the past
(quick and synthesized
multi-scales and multi-subjects scans)

Past
- 45 years
(1960 => 2005)

Future
+ 45 years
(2005 => 2050)

S1

S2

.../...

2. Debating the future
...from scenarios descriptions (own or external qualitative conjectures)

reflected / summarized into
few quantitative parameters (populations, land uses, productivities, diets, non-food uses…)

Impact of variants ?
(populations, composition of diets…)

Global
consistency ?
(equilibrium between
biomass uses & resources…)

Implications ? (international trade, GHG sink/emissions
water & energy consumptions…)

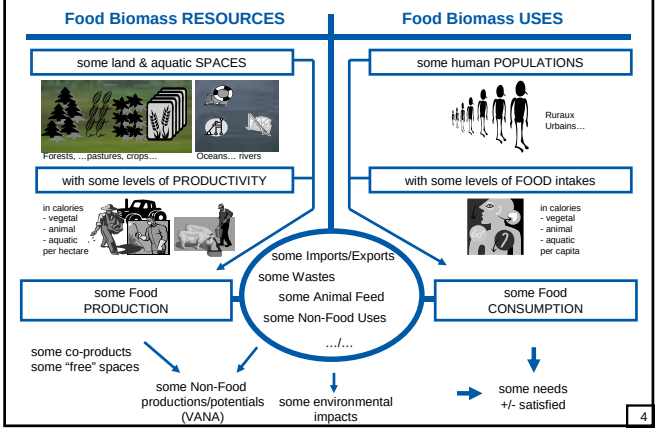
3

Part I

Basic Fact Sheet
(as on May 2008)

1. The Ambition
2. The Account Book
3. The Unit of Account
4. The Items
5. The Geographical Coverage
6. The Models for Animal Productions
7. An Interactive-Simulating Interface

❷ The account book (from national to global)



4

❸ The unit of account

Balance sheets in :

- FOOD CALORIES (or equivalent, for oilcakes, molasses…)
  - Broken up into Carbohydrates (4 kcal/g)
    Proteins (4 kcal/g)
    Fats (9 kcal/g)
    | Past only (1961-2003)
- Tonnes (or m^3) of DM in specific cases
  - Fibers, rubber…
    Crop "residues"…
    Forages…
    Wood (fuel or industrial)

5

❹ The items

- Foodstuffs & their by-products (oilcakes… wools, leathers…)
  - 120 product lines of Faostat1 (*Commodity Balances*)
    re-computed into 5 categories (after conversion into calories) :

PLANTS

Cereals : wheat, rice, barley, maize…
Sugar crops : sugarcane, sugar beat…
Pulses : beans, peas…
Oilseeds : soybean, groundnut, coconut…
Roots & tubers : cassava, potato…
Fruits & vegetables : apple, onion…
Stimulants : cocoa, coffee, alcohol…

RUMINANT Animals
Meats : bovines, goat, mutton…
Milk, Butter, Animal fats…

MONOGASTRIC Animals
Meats : poultry, pig…
Eggs…

FRESHWATER items (*Fishes…*)

MARINE items
Demersal & Pelagic fishes… Fats…

- Other items (non-food…)
  - FIBRES (cotton, jute…)
    OTHER (tobacco, rubber…)

FOREST
Fuel wood
Industrial wood…

6

❺ The geographical coverage

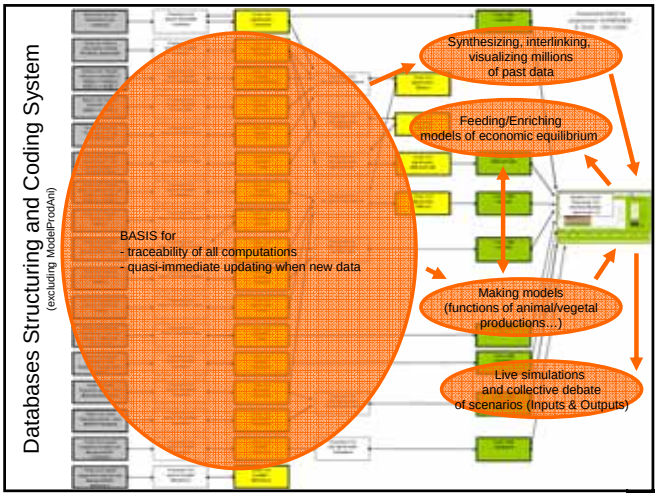
- 156 entities (on 246 "countries" since 1961) => 99% land / population
  (many islands and few other too badly-informed area -like Afghanistan- set aside…)
- with an instantaneous aggregating system into various "regions"
  - *12 options currently available :*
    - *total WORLD*
    - *developed / developing countries*
    - *the 6 MEA regions*
    - *…/…*
    - *the 87 regions of the GTPA6 model*

Data imported, checked & recomputed until today (via the SAS software) :

3000 items (areas, populations, productions, imports/exports…)
x 42 years (1961-2003) or more
x 246 countries

~ 30 millions values

7



❻ The models for animal productions

- 2 separated & interlinked categories of animal productions :
  - Prod_Rumi (Gkcal) = f (x1,x2, x3…, Prod_Mono)
  - Prod_Mono (Gkcal) = f (x1,x2, x3…, Prod_Rumi)

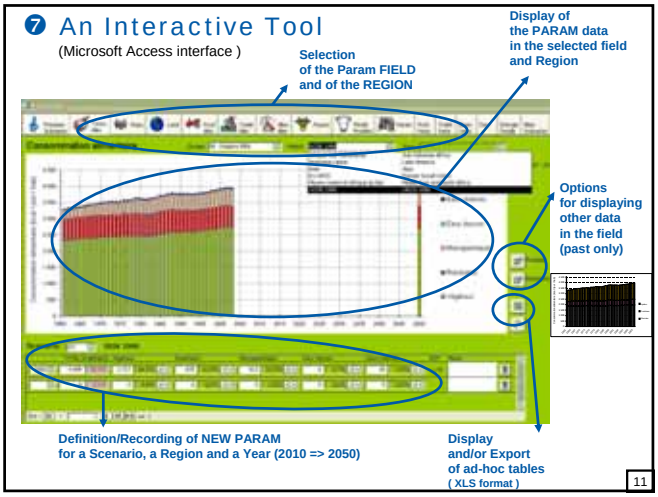
- Key explaining factors (x1, x2, x3…) :
  - Feed of vegetal origin (Gkcal)
  - Feed of animal origin (Gkcal)
  - Pasture area (1,000 ha)
  - Agricultural active population (1,000 persons)
  - Tractors (units)

- Several models obtained :
  - linear / quadratic
  - CalTot / CalPro (unit for Production unit, unit for Feed…)
  - with/without Dummies (region, year)
  - with/without Trend ("technical progress")
  - region-based (MEA regions) or type-based (agricultural/industrial, extensive/intensive…)
  - …/…

9

❼ An Interactive Tool

(Microsoft Access interface)



11

- Results :
  - replicate very-well past 40-year of national/regional/global animal productions
  - "on-line" tests and modeling (choice of model, change of parameters/coefficients, simulations…)

10

…and a general table to balance (stepwise)
In order to reach and equilibrium between simulated biomass uses and resources

12

Part II

From past trends (1961-2003) to scenarios (2050)

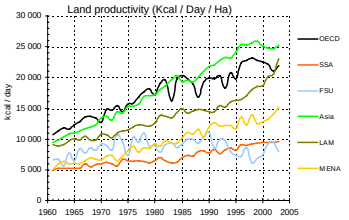
1. From Average World Increases...
2. ...to Large Regional Disparities
3. From a 2003 Balance Sheet
4. ...to Few Questions for 2050

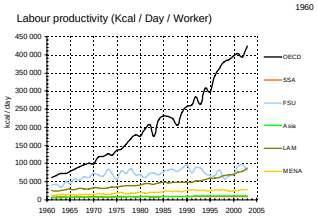
❷ ...to regional disparities

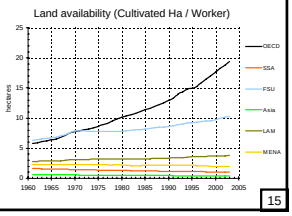
- Highest land productivity in ASIA

Note : 10 000 kcal =
~ 2.4 kg of soybean
~ 2.8 kg of rice milled
~ 2.9 kg of pea
~ 3.0 kg of wheat
~ 15.0 kg of potato
~ 58.8 kg of tomato

- A labour productivity boom in OECD



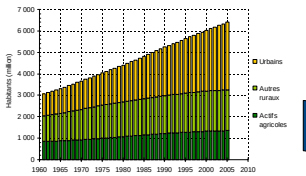




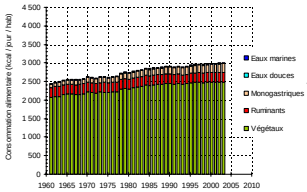
15

❶ From average world increases (1961-2003)

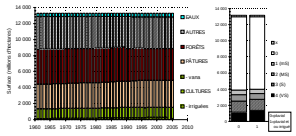
- The world population doubled



- The world apparent food supply increased from 2450 to 3010 kcal/c/d



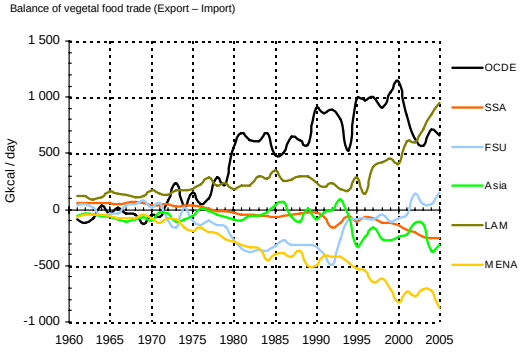
- Cultivated area ↗ (+13%)



- Pasture area ↗ (+11%)
- Land productivity ↗ (+123%)
- Labour productivity ↗ (+53%)

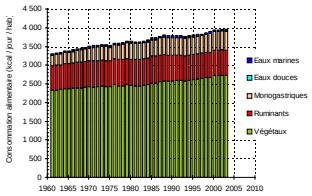
14

- Increasing food trade…



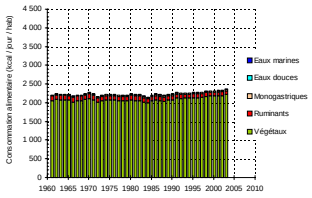
16

- But large disparities between regional apparent food availabilities



OECD

- Animal proteins : 71 g / day on 125 (60%)
- Animal fats : 89 g / day on 165 (55%)



Sub-Saharan Africa

- Animal proteins : 12 on 60 g / day (20%)
- Animal fats : 10 on 48 g / jour (20%)

17

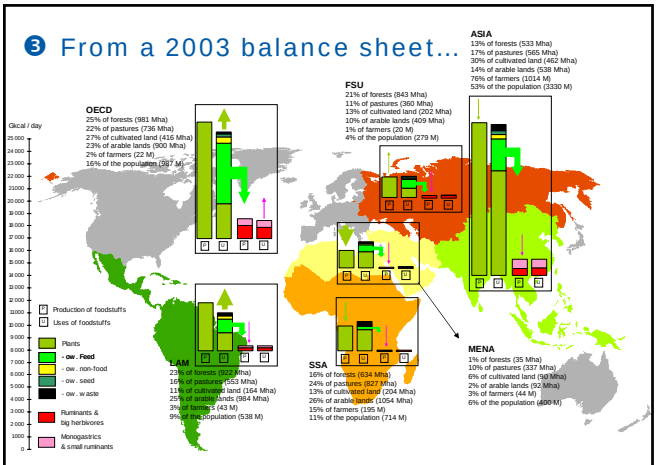
❹ ...to few basic questions for 2050

To what extent will change…

- the population ? (7 to 11 billions people)
- the calories intakes per capita ?
- the composition of the diets (vegetal/animal, macro/micro-nutrients…)
- the non-food demand for agricultural commodities ?
- the Cultivated ⇔ Pastures ⇔ Forests distribution ?
- the biomass yields ?
- the yield drivers ? (water, fossil energies, phosphates…)
- …/…

19

❸ From a 2003 balance sheet...



18

From questions

to scenarios